

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

REC'D 29 MAR 2006  
WIPO PCT

Applicant's or agent's file reference S3623-00021	<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/GB2005/001109	International filing date (day/month/year) 24.03.2005	Priority date (day/month/year) 24.03.2004	
International Patent Classification (IPC) or national classification and IPC INV. B65D41/04			
Applicant BAPCO CLOSURES RESEARCH LTD ET ALL.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 8 sheets, as follows:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the report</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the International application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>			
Date of submission of the demand 14.10.2005	Date of completion of this report 29.03.2006		
Name and mailing address of the International preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer Fournier, J Telephone No. +31 70 340-1031		

## **INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

International application No.  
PCT/GB2005/001109

### **Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:

International search (under Rules 12.3 and 23.1(b))

publication of the international application (under Rule 12.4)

international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

### Description, Pages

**1, 2, 6-14** as originally filed  
**3-5, 5a** received on 11.11.2005 with letter of 14.10.2005

## **Claims, Numbers**

1-27 received on 11.11.2005 with letter of 14.10.2005

## **Drawings, Sheets**

1/6-6/6 as originally filed

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:

  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

  - the description, pages
  - the claims, Nos. 1
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2005/001109

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	3-16, 18-21, 23-27
	No:	Claims	1 2 17 22
Inventive step (IS)	Yes:	Claims	3-16, 23-27
	No:	Claims	1 2 17-22
Industrial applicability (IA)	Yes:	Claims	1-27
	No:	Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.  
**PCT/GB2005/001109**

**Re Item I**

**Basis of the report**

The amendments filed with the letter dated 14.10.2005 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the following:

**1- foil/element thin enough to be flexible**

The applicant has deleted the feature "foil" in claim 1 in the wording "a plastics coated aluminium foil element". This deletion is considered as a generalisation which introduces subject-matter which extends beyond the content of the application. This feature is presented as essential in the disclosure of the invention as only a foil is mentioned to provide the gas barrier.

Furthermore, the wording "in that the coated aluminium element is thin enough to be flexible" has been added to the characterising part of claim 1. As in its letter dated 14.10.2005, the applicant did not explain where the basis for this amendment can be found and such basis is not evident from the application, this amendment is considered as introducing subject-matter which extends beyond the content of the application as filed. Moreover, as all plastics coated aluminium elements are flexible, claim 1 is now unclear.

**2-Surface/material**

Claim 1 refers to a peripheral edge fused into material of the cap. It is not clear to what the wording "into material of the cap" refers. Moreover, the peripheral edge of the foil element is presented in the disclosure of the invention as fused to a surface of the cap. This modification introduces subject-matter which extends beyond the content of the application as filed.

Claim 1 has been examined disregarding these amendments.

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.  
**PCT/GB2005/001109**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

- 1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1 and 2 is not new in the sense of Article 33(2) PCT.

**Independent claim 1:**

The document D2 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses a reclosable plastics cap (54) having a top panel, a skirt and a plastics aluminium foil element (10) attached to the cap to provide a gas barrier inhibiting gas flow through the cap, such that a peripheral edge of the aluminium element cannot come into contact with the contents of a container closed by the cap (54). The plastics coated aluminium foil element has its peripheral edge fused into a surface of the cap (54), see column 2, lines 50-62.

As D2 discloses all the technical features of claim 1, the subject matter of this claim is not new in the sense of Article 33(2) PCT.

**Independent claim 2:**

D2 discloses a reclosable plastics cap (54) having a top panel and a skirt, wherein a plastics aluminium foil liner (10) has a peripheral edge that is embedded and fused into a surface of the cap. The wording "embedded and fused into a surface" is not clear but disregarding this clarity issue the following has to be observed:

The peripheral edge of the polypropylene homopolymer layer (34) is a peripheral edge of this liner (10). This edge is fused into a surface of the closure member (54), see column 2, lines 50-62.

The aluminium foil liner is embedded into the closure member (54), see figures 4 and 5.

As D2 discloses all the technical features of claim 2, the subject-matter of this claim is not new in the sense of Article 33(2) PCT.

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.  
**PCT/GB2005/001109**

- 2 Claims 17 and 22 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty.
- 3 Dependent claims 18-21 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step.
- 4 The combination of the features of dependent claims 3-13,23-24 is neither known from, nor rendered obvious by, the available prior art.
- 5 Claim 14:  
The document D4 is regarded as being the closest prior art to the subject-matter of claim 14, and discloses a reclosable plastics cap according to the preamble of claim 14.  
The subject-matter of claim 14 is new (Article 33(2) PCT) and considered as involving an inventive step (Article 33(3) PCT).  
  
Independent claims 15 and 16 meet the requirements of the PCT with respect to novelty and inventive step.
- 6 Claim 25 relates to a method of producing a cap.  
D1 is considered to represent the most relevant state of the art.  
  
The problem to be solved by the subject matter of claim 25 may be regarded as how to embed the peripheral edge of the foil into the cap without the use of additional components.  
This problem is solved by provided a sacrificial wall which, when heated, melts to embed the foil edge.  
  
Therefore, claim 25 meets the requirements of the PCT with respect to novelty and inventive step.

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.  
**PCT/GB2005/001109**

Independent claims 26-27 meet the requirements of the PCT with respect to novelty and inventive step.

**EPO -DG 1**

11.11.2005

Owens-Illinois Closure Inc have, for example, announced a moulded-in ~~in liner~~ seal that uses multiple thin layers of barrier material as described in US6399170 (Hock). This material tends to be expensive and brittle and is not well suited to function as a seal. Accordingly various designs have been suggested for use of such a barrier with other sealing structures. See EP-A- 1081 058 (Riffer) and US 2003/0057175 A1 (Willingham et al). These moulded liner sealers have been developed to provide gas barrier levels equal to or better than foil. While aluminium foil has excellent gas and humidity barrier properties, it is undesirable to allow exposed metal to come into contact with many products due to its propensity to cause corrosion under conditions of prolonged contact.

The problems of providing an oxygen barrier with a plastic or metal/plastic or metal closure are also discussed in WO 02/14171 (White Cap, Inc). An oil-free, single layer plastics liner is proposed as a liner to provide a gas barrier and also to act as a sealing gasket. Such a solution results in a closure that requires a high torque for removal if a good seal is to be achieved. Closures made of composite materials are also relatively expensive to produce. Sealing against a rim of the bottle mouth also requires the rim to be level and smooth. These conditions are not always possible after heat treatment.

US4774134 (Kehe) discloses a reclosable plastics cap having a top panel, a skirt and a plastics coated aluminium element attached to the cap to provide a gas barrier inhibiting gas flow through the cap, such that a peripheral aluminium edge of the aluminium element cannot come into contact with the contents of a container closed by the cap in use. Kehe uses an over moulding technique which requires the element that is moulded into a cap during production to be relatively rigid. Kehe teaches the use of gas barrier insert including a layer of metal foil, a primer coating on one face, a plastic bonding layer and an organosol coating over moulding requires a robot to hold an insert in place in each cap mould and this is an expensive and time-consuming procedure.

US 5685443 (Taber) also describes a reclosable plastics cap. In this cap an end panel has a central portion formed of metal or other suitable oxygen barrier material. A free

edge on the outer periphery of the end panel member is said to be "encapsulated" by a gasket. The upper and lower surfaces of the end panel are generally free of plastic. Taber's gasket is a separate element of a side seal type placed in the interior of the cap to provide direct sealing engagement with a bottle neck. Taber teaches that the bond or adhesion between the gasket and the metal disc can be increased by preheating the metal disc or applying an adhesion-enhancing coating thereto.

In order to minimise the amount of oxygen entrained in a bottleneck during the capping process, it is usual for nitrogen to be continuously blown over the necks of the bottles. The inert nitrogen displaces any oxygen trapped in the neck of the bottle above the contents. However, the nitrogen does not displace oxygen that is trapped in the caps as they are lowered onto the necks. As a result a small but significant amount of oxygen is entrained and inevitably becomes trapped within the sealed bottles. This is a particular problem for screw cap closures.

GB 808612 (Lohrer) discloses a reclosable plastics cap having a top panel, a skirt, a gas barrier to inhibit gas flow through the cap, and a closed plug substantially filling a void inside the cap to define a valve adapted to fit inside and seal against an inner wall of a neck of a container to which the cap is fitted. Lohrer describes the closed plug as a stopper part and teaches that it can be closed at the top by a sealing disk which may be made from a material impermeable to gas, such as polystyrol. This will not create an effective gas barrier as the clip mechanism taught by Lohrer will not itself be gas tight.

#### Technical Problem

To provide a complete solution for gas-tight packaging in plastics containers that may have distorted necks, it is necessary to solve the technical problem of providing a reclosable, resealable closure with an integral gas barrier that can be fitted with minimal bottle top loading pressures during capping whilst being aseptic-compatible. A further technical problem is presented by the need to prevent oxygen being introduced into the container when the closure is fitted.

#### Solution of the Invention

Instead of plastics liners and wads, the present invention provides a solution in which

the advantages of an aluminium foil gas barrier are provided within a plastics cap. It is therefore possible to produce closures made from two materials, a plastics cap component and lightweight, flexible coated aluminium foil, in a variety of configurations that solve the technical problems identified.

- 5 The present invention provides a reclosable plastics cap having a top panel, a skirt and a plastics coated aluminium element attached to the cap to provide a gas barrier inhibiting gas flow through the cap, such that a peripheral aluminium edge of the aluminium element cannot come into contact with the contents of a container closed by the cap in use; characterised in that the coated aluminium element is thin enough to be
- 10 flexible and has its peripheral edge fused into material of the cap. This can be achieved by arranging the gas barrier on the top panel or sandwiched above a valve plate. New design possibilities are opened up by an appreciation that the gas barrier does not need to face the contents of the container to be effective.

- 15 Alternatively the present invention also provides a reclosable plastics cap having a top panel and a skirt, wherein a plastics-coated aluminium foil liner has a peripheral edge that is embedded and fused into a surface of the cap.

- By using a plastics-coated liner with an embedded edge the contamination risk from an exposed aluminium edge is avoided. The key to the fusing of the edge into the cap lies in a realisation that with a suitable arrangement of sacrificial walls or the like in the
- 20 component from which the cap is made induction heating can be employed to embed the edge completely without leaving any crevices that would prevent effective sterilisation of the assembly cap.

- This type of cap may be used together with a valve to provide resealability. It can also be used with threaded or snap-on caps. The edge is preferably embedded into the
- 25 internal surface of the top panel or of a valve of the cap, but may also be embedded into the external surface of the top panel or wrapped over the top of the cap and embedded into the skirt. By fusing the edge into the material of the cap the same level of protection is provided as with the normal coating on the major surfaces of the foil.

The invention also provides a plastics component for use in manufacturing such a cap,  
S3623/00021/2727531 v.8 10

wherein an annular wall extends from the top panel in order to define a recess to receive the foil liner. The recess can be beneath or on top of the top panel. Preferably the annular wall has an intermediate, reduced cross-section portion in order to enable a lower part of the wall to be folded back towards the top panel in order to retain the peripheral edge of the foil liner during production.

The invention also provides a reclosable plastics cap having a top panel, a skirt, a gas barrier to inhibit gas flow through the cap, and a closed plug substantially filling a void inside the cap to define a valve adapted to fit inside and seal against an inner wall of a neck of a container to which the cap is fitted, characterised in that the gas barrier is provided by means of a plastics coated aluminium foil fused with plastics material of the cap.

The present invention further provides a method of producing a cap from a plastics component comprising a top panel surrounded by a skirt, a receiving recess for a barrier foil, and a sacrificial wall, the method comprising the steps of placing a barrier foil into the recess and heating the wall to melt the plastic material of the wall in order to embed an edge of the foil into the cap.

The heating is preferably carried out by induction heating the foil to melt the wall, as this avoids contact with the cap and promotes clean and quick production.

Such a method is aseptic-friendly as the resulting cap has smooth surfaces and no additional crevices in which bacteria may escape when the cap is being rinsed and flushed.

Other features of the invention are defined in the appended claims.

#### Brief Description of the Drawings

In order that the invention may be well understood, four embodiments thereof will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

EPO

11.11.2005

16

103

## Claims

1. A reclosable plastics cap (2) having a top panel (4), a skirt (6) and a plastics coated aluminium element (30) attached to the cap (2) to provide a gas barrier inhibiting gas flow through the cap, such that a peripheral aluminium edge of the aluminium element cannot come into contact with the contents of a container closed by the cap in use; characterised in that the coated aluminium element is thin enough to be flexible and has its peripheral edge fused into material of the cap.  
5
2. A reclosable plastics cap (2) having a top panel (4) and a skirt (6), wherein a plastics coated aluminium foil liner (30) has a peripheral edge (32) that is embedded and fused into a surface (40, 70) of the cap (2).  
10
3. A cap (2) as claimed in claim 1 or 2, wherein the foil edge (32) is embedded and fused into an internal surface (40) of the top panel (4).
4. A cap (2) as claimed in claim 1 or 2, wherein the foil (30) is fused to an external surface (70) of the skirt (6) or top panel (4) of the cap (2).  
15
5. A cap (2) as claimed in any one of the preceding claims, wherein an opening (66) is formed in the top panel (4).
6. A cap (2) as claimed in any one of the preceding claims, wherein a valve (20), adapted to fit inside and seal against an inner wall of a neck of a container to which the cap is fitted, depends from the top panel (4).  
20
7. A cap (2) as claimed in claim 6, wherein the valve (20) is provided on a plate (62), which traps the foil liner (30) to an internal surface of the top panel (4).
8. A cap (2) as claimed in claim 7, wherein the plate (62) has an opening (68) which cooperates with a corresponding opening (66) in the top panel to enable the foil to be pierced to access the contents of a container closed by the cap in use.  
25

9. A cap (2) as claimed in claim 6, wherein the foil edge (32) is embedded and fused into an internal surface of the valve (20).
10. A cap (2) as claimed in any one of claims 6 to 9, wherein a closed plug (92) is formed inside the cap to substantially fill a void inside the cap and to define the valve (20).  
5
11. A cap (2) as claimed in claim 10, wherein the foil liner (30) forms or covers an internal or external end face of the plug (92).
12. A cap (2) as claimed in claim 10, wherein an interior of the plug (92) is defined by a recess (90) lined with the foil liner (30).
- 10 13. A cap (2) as claimed in claim 10 or 11, wherein an interior of the plug (92) is lined with EVOH or other similar gas barrier plastics material.
14. A reclosable plastics cap (2) having a top panel (4), a skirt (6), a gas barrier (30) to inhibit gas flow through the cap (2), and a closed plug (92) substantially filling a void inside the cap to define a valve (20) adapted to fit inside and seal against an inner wall of a neck of a container to which the cap is fitted, characterised in that the gas barrier is provided by means of a plastics coated aluminium foil (30) fused with plastics material of the cap.  
15
15. A cap (2) as claimed in any one of claims 6 to 14, wherein the plastics coated aluminium foil (30) extends across the entire width of the valve (20).
- 20 16. A cap (2) as claimed in claim 15, wherein the aluminium foil also extends up or down the wall of the valve (20).
17. A cap (2) as claimed in any one of the preceding claims, wherein the skirt (6) is threaded (10).
18. A cap (2) as claimed in any one of the preceding claims, wherein oxygen scavenger materials are used in parts of the cap touching or close to a product in a container to which the cap is fitted in use.  
25

19. An assembly of a cap as claimed in any one of the preceding claims and a glass, plastics, steel or aluminium bottle, jar or any other container.
20. An assembly of a cap as claimed in any one of claims 1 to 18 and a container made of paperboard or composite material.
- 5 21. An assembly of a cap as claimed in any of claims 1 to 18 and a thermoformed container.
22. A plastics component (28) for use in manufacturing a cap (2) as claimed in any one of claims 1 to 13, wherein an annular wall (20,50) extends from the top panel (4) in order to define a recess (48) to receive the foil liner (30).
- 10 23. A plastics component (28) as claimed in claim 22, wherein the diameter of the foil liner is smaller than the neck of a bottle or container to which the cap is to be fitted in use.
24. A plastics component as claimed in claim 22, wherein the wall (20, 50) has an intermediate, reduced cross-section portion (56) in order to enable a lower part 15 (54) of the wall to be folded back towards the top panel in order to retain the peripheral edge (32) of the foil liner during production.
25. A method of producing a cap (2) from a plastics component (28) comprising a top panel (4) surrounded by a skirt (6), a receiving recess (48) for a barrier foil, and a sacrificial wall (50), the method comprising the steps of placing a barrier 20 foil (30) into the recess (48) and heating the wall (50) to melt the plastic material of the wall in order to embed an edge (32) of the foil (30) into the cap (2).
26. A method as claimed in claim 25, wherein the heating step comprises induction heating the foil (30) to melt the wall (50).

27. A method as claimed in claim 25 or 26, wherein the foil (30) is oversized and when placed into the recess (48) has its peripheral edge (32) pressed against an inner surface of the recess (48).